

PROCEEDINGS OF THE ROYAL ENTOMOLOGICAL SOCIETY OF LONDON

SERIES C. JOURNAL OF MEETINGS

VOLUME 23

No. 11, 1958

REPORT OF THE COUNCIL, 1958

Council is happy to report a continuing steady rise in the Fellowship, which now stands at 1326, an increase of 41 for the year, which has resulted from the addition of 84 new Fellows. Against this must be set the loss of 45 by death, resignation and the operation of Bye-Law XVI (3). Details of these losses and of the present composition of the Fellowship are set out in Appendix I.

Publication continues to be the main work of the Society and it is desirable that this should be so. It is the one activity from which all Fellows, at whatever distance, benefit equally. The large number living abroad can seldom, if ever, take advantage of the other services the Society provides; we like to think they find the publications of interest and value and feel that they are in regular touch with us through *Proceedings Series C*.

Volume 110 of the *Transactions* appeared at intervals during the year and the *Proceedings* were continued in the usual three series. Three new parts of the *Handbooks for the Identification of British Insects* have also been published and a further three parts are in the press. Synoptic details of the numbers of pages and papers published, and the subjects dealt with, are included as Appendix II of this report. In addition to the scientific publications, a List of Fellows as at 1st January, 1958 has also been printed and a copy was sent to all Fellows earlier in the year.

It is now over nine years since the first parts of our *Handbooks* series appeared and the 26 parts now published have dealt with seven small Orders and made considerable progress with three large Orders. 1959 will see a start made on the Hemiptera volume and also the publication of the Neuroptera, Mecoptera and Megaloptera *Handbook*, as well as a further large contribution to the Hymenoptera volumes in the publication of the keys to the Ichneumoninae. The demand for the *Handbooks* from workers on the continent and even further afield has been most encouraging and Council feels that these works represent a service to entomology.

In the Library, Council would like to take the opportunity of recording that the large arrears of cataloguing the Society's collection of separates have been overtaken and the Library includes, in addition to monographs, periodicals and reference books, some 35,000 separates catalogued by author.

It is a pleasure to record the Society's thanks to those Fellows who present copies of their works. The Library has also benefited by a large gift of separates by Miss Dorothy Jackson and by a bequest of the works on natural history in the library of the late Miss Davenport.

The Librarian has corrected and brought up to date lists of our serial holdings

for inclusion in the new editions of the *World List of Scientific Periodicals* and the *British Union Catalogue of Periodicals*.

The number of books and periodicals lent to Fellows and institutions has continued at approximately the same level as in previous years, the total number of loans being 1815 (1816)*, including 81 to the National Central Library and 41 to the Association of Special Libraries and Information Bureaux; the number of borrowers was 918 (978). It has also been a pleasure to help some of our overseas Fellows by supplying photographic copies of articles not otherwise available to them.

The Society's Library is its most valuable possession and its availability and resources are not perhaps fully appreciated by Fellows. These resources are not limited to the works on our shelves. As an outlier of the National Central Library, we are able to borrow and lend through the inter-library loan service and a reciprocal loan arrangement is maintained directly with kindred organisations, 249 works having been lent to such bodies during the year.

The present high cost of sending parcels of bound volumes on loan by post must inhibit many private borrowers, but the Society is always ready to assist as far as possible in the checking of references and in copying short extracts. When a separate of the paper required is available, the cost of postage is greatly reduced.

Ten Ordinary Meetings were held during the year and the average attendance of 82 (81) was about the same as in the previous year. An attempt was made to cater for as wide a range of interests as possible, a matter which presents some problems with the increasingly specialised approach to entomology and the fact that the proportion of our Fellows available to read papers is small. Council were pleased to welcome a number of entomologists from overseas at the meetings, and it gave them particular pleasure to have the opportunity of giving a sherry party to some 150 overseas entomologists and their wives attending the XVth Zoological Congress in July.

A new $3\frac{1}{4} \times 3\frac{1}{4}$ inch projector has been installed in the Meeting Room to replace the old Leitz epidiascope. Through the kindness of Miss Jackson, the Society has been presented with a microscope for use in the Meeting Room and a Watson Service microscope has been purchased from the Society's funds.

The standing Committees of Council, the Finance and House Committee, the Publication and Library Committee and the Committee for the Protection of British Insects have continued to take care of the detailed work of the Society under the Chairmanship of Mr. H. L. G. Stroyan, Dr. B. M. Hobby and Mr. H. M. Edelman respectively and Council is grateful to the Fellows who have served on these Committees. Council has felt it timely that the Protection Committee should review its status and duties and the best means of carrying out the latter, with a view to its reconstitution. In this connection, Council has also endeavoured to establish and maintain contact with the Nature Conservancy, and a Liaison Committee has been set up to hold regular meetings with that body. In the hope of bringing the work and aims of the Conservancy to the notice of Fellows, the Deputy Director-General and Dr. N. W. Moore kindly agreed to talk at the January, 1959 meeting.

In an associated field, Fellows will be pleased to learn that the Society is a founder member of the newly established Council for Nature, on whose Executive Committee our Honorary Treasurer now serves.

No changes have taken place in the delegates representing the Society on permanent outside bodies. We have again been represented at a number of Congresses and Celebrations. At the invitation of the XVth International Congress of Zoology, the Society's President served as a Vice-President of the congressional

* The numbers in brackets are the corresponding figures for the previous year.

meetings, and Dr. W. D. Hincks and Mr. H. L. G. Stroyan represented the Society at the Colloquium on Zoological Nomenclature which preceded the Congress. Mr. N. D. Riley represented the Society at the Sixth General Assembly and Seventh Technical Meeting of the International Union for the Conservation of Nature in Athens, Dr. Charles Ferrière at the Centenary Celebrations of the Schweizerische Entomologische Gesellschaft, Mr. J. Balfour-Browne and Mr. P. F. Mattingly at the Glasgow meeting of the British Association, Mr. J. H. Armitt and Mr. P. Siviter Smith at the Centenary Exhibition of the Birmingham Natural History Society and Mr. R. B. Benson at the Conference on the Conservation of Nature in south-east England organised by the South-Eastern Union of Scientific Societies.

The Society continues to benefit in many ways from the presence of its tenants, the Mineralogical Society and the Institute of Biology. The latter body has expanded considerably since it became the Society's tenant in 1955 and it will shortly take over the fifth floor of this house, which has, unfortunately, made it necessary to terminate the arrangements by which the International Trust for Zoological Nomenclature had the use of one of the rooms on that floor.

The reports of Council for the thirteen years which have elapsed since the war have all recorded steady progress. A study of the Fellowship shows that the pattern of the Society is changing and, whereas rather less than one-third of a total of 723 were resident abroad in 1945, more than two-fifths of the present 1326 live outside these islands. It is also noteworthy that 930, or nearly three-quarters of the present Fellows, have been elected since 1946. While this development is the direct result of the impetus given to entomology during the war years, it has more significance to the Society than a mere increase in numbers and a wider geographical distribution. The proportion of professional entomologists is now far higher and this is reflected in the papers read at our meetings and published in our journals.

The object of the Society as expressed in its Royal Charter nearly a century ago nevertheless remains unchanged. In continuing to direct the Society's affairs for the advancement of entomology, Council will endeavour to meet the new demands now made by our science.

APPENDIX I—THE FELLOWSHIP

During the year 1958 the Society has lost 45 (34) Fellows. The detailed statement is as follows :

1 *Honorary and 12 (8) Ordinary Fellows by death*

R. W. Lloyd (Honorary Fellow)	H. M. Hallett
J. F. Bird	A. V. Hedges
C. G. Clutterbuck	A. R. Leivers
Miss R. M. Davenport	W. Rait-Smith
H. C. Efflatoun	F. I. van Emden
C. E. Fisher	G. D. Winston
W. McAuley Gracie	

20 (14) *Fellows by resignation*

M. D. Bates	Mrs. B. E. Harding
D. J. Billes	J. S. Hough
F. C. Bishopp	F. G. W. Jones
H. Blackiston	H. S. Leeson
L. Broadbent	H. F. Lower
J. K. Chorley	Miss N. C. Massy
W. P. Colhoun	N. C. E. Miller
L. G. Cox	F. B. Notley
R. A. Denne	Miss M. Samman
L. E. S. Eastham	D. J. Taylor

12 (12) *Fellows under Bye-Law XVI (3)*

Miss E. M. E. von Bertele	Miss S. Husain
J. de Melho Carvalho	R. D. Khare
D. Coghill	R. B. W. Lowndes
E. H. Colhoun	T. J. Naudé
B. S. Doubleday	J. Roantree
G. R. Fenton	D. W. Rorke

During the year 80 (99) Fellows have been elected, of whom 63 had qualified by 31st December. 21 Fellows elected in 1957 completed the formalities in 1958, giving a total of 84 new Fellows. The number of Fellows on the List is 1326 (1285) (22 Honorary Fellows and 1304 Ordinary Fellows) with a further 15 to complete their obligation.

APPENDIX II—THE PUBLICATIONS

The Publications for the year 1958 comprised 1250 pages, with a List of Fellows as at 1st January in addition.

The detailed statement is as follows :

	<i>Transactions</i> <i>Volume 110</i> 566 pages 3 plates	<i>Proceedings A</i> <i>Volume 33</i> 208 pages 3 plates	<i>Proceedings B</i> <i>Volume 27</i> 199 pages 2 plates
<i>Subjects dealt with</i>	<i>Number of papers included</i>		
Diptera	3	8	12
Coleoptera	5	5	5
Hymenoptera	3	2	4
Hemiptera	2	5	5
Lepidoptera	1	2	—
Mallophaga	1	—	1
Orthoptera	1	1	1
Dermaptera	—	2	—
Collembola	—	—	3
Isoptera	—	—	2
Protura and Diptera	—	—	1
Odonata	—	—	1
Trichoptera	—	1	—
Thysanoptera	—	1	—
General Entomology	1	1	—
	17	28	35

Proceedings, Series C. Journal of Meetings

Volume 23, Nos. 1–10 have appeared in advance of the Ordinary Meetings. No. 11 will include the President's Address and Annual Reports and Accounts and will comprise about 100 pages.

Handbooks for the Identification of British Insects

Volume V, part 5 (b) : Coleoptera : Phalacridae, by R. T. Thompson. 17 pages.

Volume VI, part 2 (c) : Hymenoptera : Symphyta (concl.), by R. B. Benson. 120 pages.

Volume VIII, part 2 (a) : Hymenoptera : Chalcidoidea (part), by Ch. Ferrière and G. J. Kerrich. 40 pages.

TREASURER'S REPORT

I wish to place before you the balance sheet and accounts of the Royal Entomological Society of London for the year ended 31st December, 1958. They have been audited by our accountants, Messrs W. B. Keen & Co.; this is the fortieth year in which they have done so. I would like to report as follows:—

Taking the Statement of Income and Expenditure of the General Fund, the income from subscriptions has risen by £134 to £4,030, whereas the income from interest on investments (the Capital Reserve Fund and the Hugh Main Fund) has decreased slightly by £17 to £854.

Over a period of years we have enjoyed a steadily increasing income from the sale of our *Transactions* and *Proceedings*, a substantial part of it being for back numbers. For the year ending 31st December, 1957 the income from the sale of our publications reached the figure of £5,642. For the year under review, however, I have to report a very substantial drop in income from this source to £4,306—a decrease of £1,336. This decrease is due, in large part, to the sale of long runs of our journals having virtually ceased. The Libraries and Institutes who have purchased the runs still continue to be subscribers.

Income from our tenants of £767 fluctuates only with the cost of fuel and services. Income from Bank Deposits is £53 more than last year. This exceptional figure was due to our having been able to place a substantial sum on deposit when the rate of interest was high.

On the other side, our total expenditure at £11,852 was only £158 more than in 1957, although we spent £326 more on the library than in 1957. Indeed we maintained the same output of publication without any external financial assistance. I think this reflects the greatest credit on our Registrar and her staff and I know you will want me to convey your warmest thanks to her for this great effort.

The overall picture in this account is an excess of expenditure over income of £1,249, which emphasises that sale of publications is an unpredictable source of income in any one year, and we must so organise our finances that we do not have to rely too much on it.

I will now examine the state of our various funds. I have already mentioned the Library Fund—we spent £573 on new books this year against £434 last year; binding and insurance has cost us £294 this year compared with £229 last year. We have now overtaken much arrears of binding, and I do not propose that we spend as much as this in the current year.

In the Repairs and Improvements Fund we spent £578 during the year, and, although we must make ample provision year by year, no large sums for repairs are foreseen for the coming year.

In the Handbooks of British Insects Fund, although the income from sales exceeded the cost of printing, the total expenditure exceeded income for the year by £282. A number of parts of this series are in course of publication and again I feel that during the coming year we should wait for income from the old unsold stock before undertaking very much more new work. This may mean some reduction in output during 1960.

Our Capital Reserve Fund in the Balance Sheet stands at £11,276 and the Hugh Main Fund for the Advancement of Entomology at £12,693. At this point I should mention that it has been thought advisable to merge the Special Publication Fund with the Handbooks Fund. Our freehold premises at 41, Queen's Gate are not valued in the Balance Sheet, nor are our considerable stocks of unsold publications.

Our tenants on the fourth floor, the Institute of Biology, have recently taken on the organisational work for the Council for Nature, and have asked permission to lease our fifth floor. This Council has granted and, although the repairs and decorations required will more than take up the first year's rent, it will in the future, we hope, be a small source of revenue. Two bequests were made to us during the year—Dr. Winston £200 and Mr. Rait-Smith £1000, although this latter has not yet been received. A point of financial interest to all Fellows whose work relates to entomology is that they may now claim their subscriptions to the Society as an expense for income tax purposes.

In conclusion, I would not like to let this occasion pass without rendering the thanks of the Society to the members of our Investment Sub-committee who did much detailed work in arranging the redistribution of our investments on the basis of the general recommendations of the Royal Society.

STATEMENT OF INCOME AND EXPENDITURE for the Year ended 31st December, 1958. (continued)

LIBRARY FUND.			
INCOME.		EXPENDITURE.	
1957	1957.	£	s. d.
£	£	£	£
34	434	By New Books	573 2 7
—	229	„ Binding, Repairs and Insurance	294 17 0
—	663	„ Microfilm of Catalogue	867 19 7
512	95	„ Furniture and Equipment	—
475	55	„ Transfer to Sales of Publications—Value of Exchanges	—
987	475	„ Excess of Income over Expenditure for year carried to Balance Sheet	500 0 0
267	—	„ Excess of Expenditure over Income for year carried to Balance Sheet	34 10 0
£1,288	£1,288		£1,402 9 7

REPAIRS AND IMPROVEMENTS FUND.		
INCOME.		EXPENDITURE.
1957.	£	s. d.
£ 450	To General Fund—Transfer	62 By Repairs and Improvements
—	„ Excess of Expenditure over Income for year carried to Balance Sheet	388 „ Excess of Income over Expenditure for year carried to Balance Sheet
	£ 578 3 11	£ 578 3 11

[illegible]

GENERAL FUND.

(In addition to the above the Society holds a sum of £185 2s. 4d. on behalf of the Permanent Committee of the International Congresses of Entomology.)

	£	s.	d.	£	s.	d.
Post Office Savings Bank
General Fund
Current Account—						
General Fund	269	15	11
Library Fund	231	1	8
Repairs and Improvements Fund	79	3	5
				580	1	0
				57	13	4
<i>Less Overdrawn—Handbooks of British Insects</i>			..			
Petty Cash Account—						
General Fund	£522	7	8
Cash in Hand—						
General Fund	£204	12	4
				£21	11	3

BALANCE SHEET, 31st December, 1958.

LIBRARY FUND.

REPAIRS AND IMPROVEMENTS FUND.

HANDBOOKS OF BRITISH INSECTS.

TRUST FUNDS.

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*Finsbury Circus House,
Blomfield Street,
London, E.C.2.
19th January*

(Sgd.) W. B. KEEN & Co.,
Chartered Accountants.

THE COMMITTEE FOR THE PROTECTION OF BRITISH INSECTS.

RECEIPTS AND PAYMENTS ACCOUNT for the Period from 1st January to 31st March, 1958.

RECEIPTS.		PAYMENTS.	
To Balance at Bank 1st January, 1958	£ 11 15 4	By Oxshott Heath Conservators	£ 5 0 0
Unused Cheques	Preservation of <i>L. dispar batavus</i>	5 0 0
		Transfer to Society's General Account	1 18 2
			£11 18 2

(Sgd.) H. M. EDELSTEN, *Hon. Treasurer.*
 We have audited the above account and certify it to be correct.
Finsbury Circus House,
Blomfield Street,
London, E.C.2.
19th January, 1959.

(Sgd.) W. B. KEEN & Co.,
Chartered Accountants.

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THE ROYAL ENTOMOLOGICAL SOCIETY WICKEN FEN FUND

RECEIPTS AND PAYMENTS ACCOUNT for the year ended 31st December, 1958.

RECEIPTS.		PAYMENTS.	
To Donations	£ 46 17 6	By Balance overdrawn at Bank 1st January, 1958	£ 4 2 2
Balance overdrawn at Bank 31st December, 1958	Printing, Stationery and Postage	4 7 7
		Donation to the National Trust	43 6 4
			£47 13 1

(Sgd.) H. M. EDELSTEN, *Hon. Treasurer.*
 We have audited the above account and certify it to be correct.
Finsbury Circus House,
Blomfield Street,
London, E.C.2.
19th January, 1959.

(Sgd.) W. B. KEEN & Co.,
Chartered Accountants.

THE PRESIDENT'S REMARKS

LADIES AND GENTLEMEN,

I should like first to say something about those Fellows who have died in the past year.

HEINRICH ERNST KARL JORDAN was born in Hanover in 1861 and died on 12th January, 1959 at the age of ninety-seven. He came to England at the invitation of Walter Rothschild in 1893 and was elected to our Society in 1894. He played a large part in our affairs, serving on Council for four periods, four times Vice-President, President 1929-30, Hon. Fellow in 1945. He was elected to the Royal Society in 1932. In 1955, the Society celebrated his 94th birthday by publishing a jubilee volume in which many interesting facts about his life and work will be found as well as original papers dealing with the topics in which he had shown special interest. Jordan was primarily a taxonomist but he viewed the subject so broadly that it covered a large part of Zoology. He published more than 450 papers and dealt with so many groups that it is difficult even to touch on all his interests. It is necessary, in the first place, to mention his contribution to the monograph of the Swallow Tails in which were set out ideas on evolution which only in the last fifteen years have become universally accepted and popular. Then there is his extensive work on the Coleoptera; in the family Anthribidae alone a very high proportion of all known species was described by Jordan. Better known, and still the subject of his serious study until very recently, is his revisional work on the fleas, leading to a new classification of the order and to much work of economic and medical significance. Lastly, Jordan was a great internationalist; he played a leading part in the foundation of the International Congresses of Entomology, of which the first met at Brussels in 1910. He attended most of the subsequent meetings, where his ability to speak fluently in three languages made him a natural leader. He also played an important part in the work of the International Commission on Zoological Nomenclature of which he was honorary life president. Despite his immense achievement and erudition, Jordan was always approachable by the youngest entomologist. I well remember his kindness to me at the Entomological Congress at Ithaca in 1928. His death has deprived us not only of one of the most distinguished but also of one of the kindest and most human of our Fellows. The Society will wish to extend its sympathy to his two daughters.

ROBERT WYLIE LLOYD was born in 1868 and died on 29th April, in his ninety first year. He was elected a Fellow in 1885, so that he had been in our Society much longer than any other Fellow; he was made an Honorary Fellow in 1944. He had served on Council for five separate three-year terms and had been Vice-President on four occasions. Lloyd was many-sided, business man, connoisseur of the fine arts, mountaineer, as well as entomologist, but it is mainly the last-named interest which will be recorded here. He had a general interest in insects but latterly paid most attention to the Coleoptera. Even after he lost one leg in 1937, he still continued to collect beetles with the aid of his chauffeur and to mount and set them in the evenings. He published a number of short notes on his captures. It is understood that his collection is being presented to the Manchester Museum.

He did a great deal for this Society, the details being published in our annual reports. The two most munificent gifts were the panelling, dais and furniture of our present meeting room soon after the Society took over 41 Queen's Gate and

the presentation of the Hübner and Geyer manuscripts which our then Registrar brought out of Germany by somewhat cloak and dagger methods. He had been the owner of the *Entomologists' monthly Magazine* since 1904 and he enabled the editors to produce a considerably more extensive and better illustrated journal than its cost to subscribers strictly justified. Another very important benefaction, in conjunction with Dr. S. A. Neave, made possible the publication at a relatively low price to subscribers of the *Nomenclator Zoologicus* and the provision for supplementary volumes every ten years. With the passing of R. W. Lloyd and Karl Jordan the Society loses two important links with its Victorian era.

FRITZ ISODORE VAN EMDEN was elected to the Society in 1939 and died, tragically early, on the 2nd September when he was not quite sixty. He was at the height of his powers and his friends had hoped to have many more valuable papers from his pen, especially as several were known to be in preparation. After a distinguished career in Germany, culminating in an important post in the Dresden Museum, he came to this country in 1933 as a result of the Nazi tyranny. Up to that year he would have been thought of as a specialist in the Coleoptera and their larvae and when in this country he continued work on them so far as time allowed. Indeed he produced some of the best keys to the larvae of British beetles. But in the Commonwealth Institute of Entomology he worked as a Dipterist and with his keen eye and brain and logical methods he soon became an expert on the Muscidae and Tachinidae. These flies and their allies form a group which has given a great deal of trouble to systematists and Van Emden's work on them is a model of how such material should be treated. Dr. Van Emden was a familiar friend to many of us here and was regular in attendance at and in contributing to our meetings. He will be much missed by all who knew him and by many entomologists all over the world whom he had helped by correspondence.

WILLIAM RAIT-SMITH, who died on the 19th December age eighty three years, was elected to the Society in 1912. He served on our Council in 1924-26 and 1929-31 and was very active in our affairs at the time when the Society first occupied the present building. We understand that he has, as a last token of his interest, bequeathed the Society £1000 in his will. He was primarily interested in the Lepidoptera and had expert knowledge of variation in the British Lycaenidae. His collection has been left to the British Museum. He was a very regular attendant at our meetings until a few months ago.

HOWARD MOUNTJOY HALLETT, who died on the 15th May, age eighty years, was elected to the Society in 1912. While his business career was connected with shipping and with the export of coal, he was throughout his life a keen naturalist with a special interest in the Aculeate Hymenoptera. A great deal of his work was done in Glamorganshire and he was one of the first to discover the interesting fauna of its western sand-dunes. His fine collections are now housed in the National Museum of Wales, for whom he did a great deal of work. He had a good general knowledge of most orders of insects and was an important member of the Cardiff Naturalists' Society. After he had retired to Lea Bailey, near Ross-on-Wye, he began to make comparable discoveries in a new and also little known district. I first met Hallett in about 1917, when I was living at Cardiff, and he was a sort of unofficial entomologist at the museum and we were friends ever since and had frequently corresponded about entomology. He will be greatly missed by all who knew him.

HASSAN CHAKER EFFLATOUN was born in Cairo in 1893 and was elected a fellow of our Society in 1916. He died almost a year ago but the news did not reach us until recently. He received much of his education in England at Gloucester and at Wye College, and on his return to Egypt he occupied various teaching positions, eventually becoming Professor of Entomology at Cairo University. He was well-known in his own country as an able organiser and teacher. To

entomologists elsewhere he was known especially for his excellent taxonomic studies of the Diptera. Much of his work was published in sumptuously illustrated monographs and the second part of his large volume on the Bombyliidae will appear posthumously. His fine collection has been presented to the Egyptian Entomological Society.

RACHEL MARGARET DAVENPORT was elected to the Society in 1944, and served on the Council in 1953-54, but had recently had a long illness leading to her death on 10th July. Some of her books were bequeathed to the Society's library. She was not strictly speaking an entomologist, but through her work in preparing the *Insecta* part of the *Zoological Record* and also on the *Nomenclator Zoologicus* came to know a great deal about entomological bibliography and did work of inestimable value to many entomologists. She was for thirty-two years on the staff of what is now the Commonwealth Institute of Entomology and contributed to the very high standard of all the publications produced by the Institute.

ALFRED VANDER HEDGES, who died on 3rd June, 1957, aged sixty-four years, was elected a Fellow in 1910. He was a Lepidopterist who was quite unusually expert in breeding a great variety of species. By his success in inbreeding several Geometrids for more than one generation he obtained a number of striking new recessive forms. Unfortunately very little of his expert knowledge was put on record. Since 1939 he had lived in the Isle of Man so that he was rarely seen at our meetings.

CHARLES GRANVILLE CLUTTERBUCK, who died on 20th March in his eighty sixth year, practised as a solicitor in Gloucester but he was a well-known student of the Lepidoptera including the micros. He was elected a Fellow of our Society in 1908. He will be perhaps best remembered for his intimate knowledge of the occurrence of the Large Blue, *Maculinea arion*, in the Cotswolds. But he made many interesting discoveries also amongst the smaller Lepidoptera such as the rediscovery of the rare Plume-moth, *Pselnophorus brachydactylus*.

JOHN FRANCIS BIRD was born in 1874, was elected a Fellow in 1944 and died on 12th March. He was a friend of the late C. G. Clutterbuck whose death I recorded a few moments ago, the two families sharing musical as well as entomological interests. These latter were concerned with the Lepidoptera, especially the Pyrales and the Macros, on which he published a number of notes.

W. MCAULEY GRACIE, M.B.E., who was elected to the Society in 1945, died last April. For much of his life he served as a railway administrator but in the course of this work he became aware of the great losses which were caused by insects to foods in transit. In conjunction with Prof. J. W. Munro, C.B.E., he was able to persuade the Department of Scientific and Industrial Research that the subject was one in which they might well be interested. The flourishing D.S.I.R. laboratory at Slough and the Tolworth organisation of the Ministry of Agriculture are the direct result of this initiative. Mr. Gracie remained active in applied entomology from 1940 onwards.

CYRIL EDMUND FISHER was elected to the Society in 1938 and died at the early age of forty-five years on 12th November. At the time of his death he was curator of the Hancock Museum, Newcastle-upon-Tyne, but he had also served in the museums at Maidstone and Leeds. He was interested in Coleoptera and Hemiptera.

ABRAHAM ROBERTS LEIVERS was born in 1874 and had been a Fellow since 1927. He died on 1st March. He was a Chartered Accountant by profession but also took a keen interest in the butterflies, especially the Blues and their varieties.

GERALD DENTON WINSTON was a medical practitioner who was elected to the Society in 1938 and died on 1st November, 1957. The Society has received a bequest of £200 under his will. Very little is known to us about his interests but he had been a rather regular attendant of our meetings during recent years.

I should like also to refer briefly to the death of CECIL WARBURTON on 7th

October at the age of 105. Though he was not a Fellow of this Society, he was at one time a well-known economic entomologist and an authority on ticks.

May I ask you to stand a moment in memory of these friends and colleagues who died in the last year.

The reports of our Honorary Secretary and Treasurer have shown how our Society continues to flourish and the Fellowship expand. The evidence for the growing international importance of our work is gratifying. On the other hand the cost of running the Society and especially of our publications tends to increase in spite of all the efforts of our officers to economise on non-essentials. The great expansion since the war in the amount of entomological research undertaken has much increased the number of manuscripts laid before the Publication Committee but I believe we still print a high proportion of those which are suitable for our journals.

At the end of the two-year period during which you have honoured me by calling me to your Presidency I should like to thank you for your confidence and the Officers and Council of the Society for their indulgence. The thought that one's photograph in the entrance passage will be moved on one place is like a real entry into the pages of history. Finally, I would like to welcome my successor, Dr. B. P. Uvarov, who will preside here at your next meeting.

**Presidential Address to the Fellows of the Royal
Entomological Society of London delivered by
O. W. RICHARDS,
at the Annual Meeting on Wednesday,
4th February, 1959.**

THE STUDY OF NATURAL POPULATIONS OF INSECTS

It is a frequent and rather humiliating experience for the professional entomologist to be asked by the public simple questions which he cannot answer. A common question of this kind is why some insect is abundant this year whereas it is usually rare. There are several possible responses to this challenge. It is possible to retire to a laboratory to investigate some aspect of insect life which can be studied there under simplified conditions. Most entomologists after an argument with a sceptical farmer will feel that if laboratories did not exist it would be necessary to invent them. The retreat may even take us to an office rather than to a laboratory and we may spend our time devising theories which are difficult either to prove or disprove. Or finally, while we can hardly hope as yet to give convincing general explanations of the annual variations in the numbers of common insects, we can at least approach the subject in a concrete way by endeavouring to measure what their numbers really are, so that we have a sure basis for relating the changes in them to probable controlling agencies such as climate or enemies. The methods which may be used for making such measurements is my topic for to-night. Lest it should be supposed that I have a special prejudice against population-theory or against laboratory studies of insects, I should say that all field-work is based on some theory and the theory is more likely to be wrong if it is implicit rather than explicit. Further, in my experience, field-work consists in spending at least half your time in the laboratory.

Every species of insect offers a special problem, for there are nearly always at least minor differences in habit which make it impossible to use completely cut and dried methods. At the best they have to be modified to suit the particular species. It is this infinite variety of habit with all sorts of unexpected quirks of behaviour that make it difficult to apply theories in any detail to wild populations. A good example of what I mean was recorded by Varley and Edwards (1957, *J. Anim. Ecol.* 26: 471-7). They record that (under certain conditions) the Chalcid parasite *Mormoniella* found up to 12 hosts in 24 hours if it had recently fed on a host puparium but less than 2 if it had not. Such changes in behaviour can hardly be fitted into a detailed theory of population control. Minor variations in behaviour often determine what sampling methods can be used for a particular species, and for this reason I do not intend to discuss in detail the actual ways in which samples may be taken so much as what it is one endeavours to sample and how one deals with the figures obtained.

We may define a population of an insect species as a set of individuals whose lives are sufficiently integrated to affect one another either directly or indirectly. A population in this sense though not very sharply defined will tend to occupy a relatively small continuous area. Three features of insect populations determine the type of analysis to which they can be subjected. First there is the periodicity

of reproduction ; secondly, the degree of localisation of the population ; thirdly, the absolute number of individuals.

By periodicity of reproduction, I mean whether there is one or more generations in the year and also whether reproduction is concentrated into a short period or whether it is spread out over a much longer one. Fundamentally I believe the best distinction is between one-stage and multiple-stage populations in the sense of Taylor (1937, *The biological control of an insect in Fiji*. London, p. 13). An ideal one-stage population would lay all its eggs in one day and if these were counted the mortality could be assessed merely by the difference between first count and later ones. Several moths, e.g. *Evetria buoliana* (Schiff.) in England and *Choristoneura fumiferana* (Clem.) in Canada, are near enough to this condition for the population to be treated in this simple way. The populations of most English insects of which I have any detailed knowledge spend the winter in a one-stage condition but during much of the summer all stages, or all except the pupa, are simultaneously present for most of the time. Such populations are much harder to deal with than one-stage ones because in one common type the losses due to mortality are partly simultaneously offset by oviposition. More accurately, any one phase, say second stage larva, is being simultaneously recruited by moulting first stage and lost by death and by moulting into the third stage. There is thus no one day when all of the population is in the one stage. This arises from either a prolonged awakening out of hibernation (e.g. egg-hatching) or from a long oviposition period.

The degree of localisation (including the mobility) of the population greatly affects the details of sampling. The easiest population to study is one of a species with a single food-plant which is not so large that it cannot be completely sampled. For this reason, *Phytodecta olivacea* (Forst.) on broom (*Sarothamnus scoparius* (L.) Wimm.) is a much easier insect to deal with than *Tortrix viridana* (L.) on oak (*Quercus*). Apart from the ease of sampling broom, the adult insect is much less mobile. A literally ubiquitous species if such existed could easily be sampled on randomly chosen points on a grid. Most species, unfortunately, are not monophagous and it is difficult to define with sufficient accuracy the habitat over which there can be a homogeneous system of sampling. Again, in a non-mobile species with a well-defined habitat it is often possible to find spatially delimited populations whose profits and losses can be assessed without the complications of emigration and immigration. With highly mobile species with a less easily defined habitat such as, for instance, blowflies, the problem is very much more difficult (MacLeod and Donnelly, 1957, *J. Anim. Ecol.* **26** : 135-170, 2 pls.).

The absolute numbers of a species usually determine which sampling methods are practicable. A great many species are too rare to be easily studied—this is true of many of the populations of the tsetse fly. There is a great difference in view point between a collector of Lepidoptera and a person who is endeavouring to sample a population of one of the so-called common species. A standard method is to examine a fixed number of plant-shoots or weight of plant material. The difficulty always is to examine sufficient plant material chosen by any prescribed method to find any of the common caterpillars at all. If there is one insect to a square yard, the mobile conspicuous stages may appear common and yet the stages which can be found only by systematic sampling may appear very rare. In the converse case, where a species is too common, practical difficulties may also arise. The method of estimating numbers by marking and release becomes inapplicable if the numbers are too high (say, $> 1,000,000$) and with a highly concentrated population of active insects any method of counting is difficult.

In order to limit my subject, I shall from now on consider only one relatively accessible problem: that of a spatially well-defined population of a relatively non-mobile species which occurs for most of the summer in the multiple-stage

condition. Since the war Dr. N. Waloff and I have studied two populations of this type—some of the common British grasshoppers and the broom beetle, *Phytodecta*. In the first, the winter is spent in the egg, but the eggs hatch over such an extended period that by the middle of the summer all stages may be found simultaneously. In *Phytodecta*, the adult spends the winter underground, but during the summer the oviposition is prolonged so that all stages eventually occur together; moreover, there is a short overlap in August between the hibernated parent beetles and their own offspring which have by then become adult.

With a self-contained population, most measurements can be referred to some standard sampling unit such as one square metre or one shoot of a plant. This can readily be converted to a measurement of the total population but it is not really necessary to do so except in a few cases. In particular, the method of estimation by marking, release and recapture is one which necessarily measures the whole population and not the numbers in a sampling unit. However, the data obtained by marking can if necessary be averaged out over the number of sampling units in the area occupied by the population.

A multiple-stage population will be altering all the time as a result of growth (oviposition, moulting, pupation) and as a result of mortality. Sampling has, therefore, to be continuous throughout the growing season; if there is a gap in the sampling the season's work is spoilt and comparatively useless. After such a season's work one has a series of successive estimates of the numbers of each stage which can in turn be expressed as a series of widely overlapping curves, in shape somewhat resembling the normal curve of error and expressing the seasonal progression of each stage of the species. Owing to the effects of mortality, the curve for each stage rises to a slightly (or even much) lower height than that of the preceding stage. From these curves which represent the combined effects of recruitment and mortality (or mortality and moulting) it is necessary to deduce what was the total number of individuals of that stage during the season. So far I know of only two ways in which one can attempt to do this.

The first method is applicable when the curve of numbers is regular and soon reaches an obvious maximum after which the numbers fall steeply away. It is possible to measure the slope of the part of the curve after the maximum. If logarithms of the numbers are taken, the slope will be approximately a straight line and if the line is produced back to the date at which the stage first appeared in the field, this gives an estimate of the total number of individuals which entered that stage (Richards & Waloff, 1954, *Anti-Locust Bull.* 17:182 pp., 67 figs.; Dempster, 1957, *Anti-Locust Bull.* 27:60 pp., 27 figs.). By doing the operation on successive stages, estimates of mortality are provided by the differences between the successive estimates. The method assumes that in any one stage the mortality is approximately uniform throughout or can at least be averaged out for that stage.

In some populations, however, such as those of the broom beetle, the curves for each stage are irregular, very flat-topped and sometimes with more than one peak. To deduce the numbers of each stage in such examples we have been trying a somewhat more elaborate calculation. We start with the number of female beetles in the field which can be obtained by regular weekly sampling. Curves can be obtained experimentally which relate the number of eggs which females lay to the average temperature and the age¹ of the population. Combining this curve with estimates of the number of beetles gives estimates of the number of eggs which have been laid each week, and the sum total of these estimates gives a fixed starting-point from which to measure the losses due to mortality. The

¹ Under field conditions it is possible to use the number of days since the start of the egg-laying season instead of the mean age of the population.

argument then proceeds as follows. If n be the number of eggs laid and a be the incubation period at the prevailing temperature (which is measured in the habitat) and k be the fraction of the population which survives a unit time-interval. Then N (number of eggs found in all field samples)

$$= n \int_0^a k^t dt = n(k^a - 1)/\log_e k.$$

Provided the incubation period has been determined by experiment, this equation can be solved for k by arithmetical methods and the number of individuals which enter the first instar is nk^a . The process can be repeated for each instar in turn. Such estimates are more likely to be correct if frequent samples are taken (we usually take three or four a week) and it is in any case easier to examine several small samples carefully than to study one large one.

The theory of sampling was mainly devised for dealing with agricultural crops. If one samples a field of wheat there is no difficulty in harvesting the crop and sophisticated sampling schemes are devised to avoid the introduction of bias from local variations in soil-fertility. However, when the "crop" is a living, mobile animal, while serious sampling errors can arise from various types of patchy distribution, there is another even more important source of error arising from the difficulty of harvesting the "crop". Statistical analysis can only show that the samples are consistent with one another; they cannot show what proportion they contain of the animals that are there. Many insects alter their behaviour with the weather in such a way as greatly to affect the numbers caught in samples. But apart from this, one rarely knows what proportion of the insects which are actually present is found when one sweeps or beats vegetation, or when one searches plant material however carefully. There are two ways of guarding against these errors. The most important is to have several independent estimates of as many of the figures as possible. Marking and releasing gives an estimate completely independent from one arrived at by counts on quadrats or by beating. Suitable cages distributed over the habitat can catch insects emerging from hibernation in the spring and so give a firm estimate of the initial population. The other safeguard against error is to build up a sort of annual budget in which the numbers of each stage combined with a measured mortality lead to the numbers of the next stage. In this way, all the figures support one another and there is a chance that discrepancies will be detected.

While the immediate purpose of a programme such as I have been describing is to measure each stage of the population, the ultimate aim is to explain any changes which are observed. Thus one will simultaneously also measure, so far as possible, any factors likely to influence longevity, reproduction or mortality. This is a large subject which I can only touch on very briefly. Clearly any climatic factors which are likely to be relevant must be measured. With phytophagous insects, it is always wise to keep an eye on the food-plant, the condition of which may have a large influence on reproduction.

The measurement of mortality due to parasites is a relatively well-worked subject and I need not consider it in any detail. In any seasonal study such as I have described samples would clearly have to be dissected or caged to determine percentage parasitism at regular intervals. In a complete programme a full knowledge of the reproductive rates of the principal parasites would also be needed. The measurement of predation is much more difficult but a recent communication to this Society by Dempster (1958, *Proc. R. ent. Soc. Lond.* (C) **23**: 34) shows how it can be done in favourable cases. In the broom beetle, predation accounts at least in most years for many more deaths than parasitism. In all population studies the ideal is never to estimate mortality by the difference between two

successive population estimates unless there is also an independent estimate of the causes of mortality over the same period.

I feel I cannot end these remarks without making some reference to the population-theories which have been so much discussed in the last few years. The sort of work which I have described is relatively pedestrian but I believe that until a good deal more of it has been done discussions about population-theory, particularly of its detailed application to particular species, are likely to continue to be inconclusive. So far as the focus of most of the controversy is concerned, I have already committed myself (Richards, 1955, *J. Anim. Ecol.* **24**: 465-6) to the view, which I think I shall probably hold till my dying day, that populations of living organisms can only be controlled by agencies that act in a density-dependent manner. Both the terms "control" and "density-dependent" require definition but need not receive it here and now. A more immediately practical point and one more relevant to what I have been discussing earlier is the following. It is quite incredible to me that any existing population-theory could be numerically verified by data obtained from a wild population. Even if the theory was more nearly correct than any of the existing ones are likely to be in detail, we can hardly allow for the weather of the particular season, for the state of the food-plant and for the past history of the population itself which may well contribute important effects. I would suggest that our aims, at this stage, should not be to attempt to prove or disprove particular theories so much as to use the theories as a guide to the type of study we ought to make, and the sort of factors which are likely to be important.

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1953.

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1957

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THE FRESHWATER BIOLOGICAL ASSOCIATION, £25, towards the cost of publishing the paper by J. H. Mundie in the *Transactions*.

THE METROPOLITAN WATER BOARD, £25, towards the cost of the above paper.

1958

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PRINTED BY ADLARD AND SON, LIMITED,
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